CLAIMS:

1. A method for vaporizing reactants for vapor deposition of a thin film on a substrate, comprising:

providing an ionic liquid;

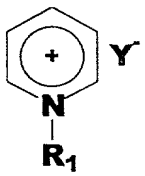
dissolving a precursor in the ionic liquid; and

passing a stream of gas through the ionic liquid.

2. The method of claim 1, further comprising heating the ionic liquid to a temperature equal to about a volatilization point of the precursor.

3. The method of claim 1, further comprising transporting vaporized precursor molecules from the ionic liquid to a process chamber.

4. The method of claim 1, wherein the ionic liquid is of the formula:

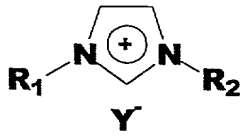


wherein R_1 is alkyl and Y^- is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.

5. The method of claim 4, wherein R_1 is an alkyl having a carbon chain comprising from about 1 carbon atom to about 30 carbon atoms.

6. The method of claim 4, wherein R_1 is selected from a group consisting essentially of methyl groups, ethyl groups, propyl groups, isopropyl groups, n-butyl groups, sec-butyl groups, tert-butyl groups, isobutyl groups, and pentyl groups.

7. The method of claim 1, wherein the ionic liquid is of the formula:

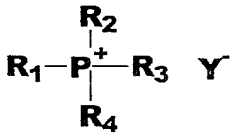


wherein R_1 and R_2 are alkyls and Y^- is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.

8. The method of claim 7, wherein R_1 is an alkyl having a carbon chain comprising from about 1 carbon atom to about 30 carbon atoms.

9. The method of claim 7, wherein R_1 and R_2 are independently selected from a group consisting essentially of alkyls, methyl groups, ethyl groups, propyl groups, isopropyl groups, n-butyl groups, sec-butyl groups, tert-butyl groups, isobutyl groups, and pentyl groups.

10. The method of claim 1, wherein the ionic liquid satisfies the formula:

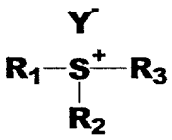


wherein R_1, R_2, R_3, R_4 are alkyls and Y^- is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.

11. The method of claim 10, wherein R_1 is an alkyl having a carbon chain comprising from about 1 carbon atom to about 30 carbon atoms.

12. The method of claim 10, wherein R_1, R_2, R_3, and R_4 are independently selected from a group consisting essentially of alkyls, methyl groups, ethyl groups, propyl groups, isopropyl groups, n-butyl groups, sec-butyl groups, tert-butyl groups, isobutyl groups, pentyl groups, and mixtures thereof.

13. The method of claim 1, wherein the ionic liquid satisfies the formula:

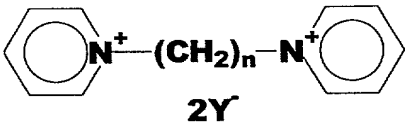


wherein R_1, R_2, and R_3 are alkyls and Y^- is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.

14. The method of claim 13, wherein R_1, R_2, and R_3 are independently selected from a group consisting essentially of alkyls having carbon chains comprising from about 1 carbon atom to about 30 carbon atoms.

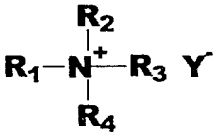
15. The method of claim 14, wherein R_1, R_2, and R_3 are independently selected from a group consisting of alkyls, methyl groups, ethyl groups, propyl groups, isopropyl groups, n-butyl groups, sec-butyl groups, tert-butyl groups, isobutyl groups, and pentyl groups.

16. The method of claim 1, wherein the ionic liquid satisfies the formula:



wherein n is from about 1 to about 10 and Y^- is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.

17. The method of claim 1, wherein the ionic liquid satisfies the formula:



wherein R_1, R_2, R_3, R_4 are alkyls and Y^- is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof.

18. The method of claim 17, wherein R_1 is an alkyl having a carbon chain comprising from about 1 carbon atom to about 30 carbon atoms.

19. The method of claim 17, wherein R_1, R_2, R_3, and R_4 are independently selected from a group consisting essentially of alkyls, methyl groups, ethyl groups, propyl groups, isopropyl groups, n-butyl groups, sec-butyl groups, tert-butyl groups, isobutyl groups, pentyl groups, and mixtures thereof.

20. A method for vapor deposition of a thin film on a substrate, the method comprising:

providing an ionic liquid including one or more precursors;

heating the ionic liquid;

transporting the precursor in the vapor phase from the ionic liquid to a substrate; and

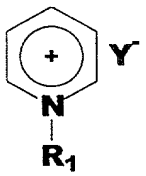
depositing the precursor on the substrate.

21. The method of claim 20, wherein the precursor is dissolved in the ionic liquid.

22. The method of claim 20, wherein the vapor-phase precursor is distilled from the ionic liquid and transported to the substrate by a carrier gas.

23. A method for vaporizing reactants for vapor deposition of a thin film on a substrate, comprising:

dissolving a precursor in a solvent that satisfies the formula:

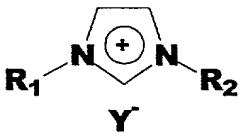


wherein R_1 is an alkyl and Y^- is selected from a group consisting essentially of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof; and

bubbling a stream of gas through the solution containing the precursor to distill precursor molecules in the vapor phase from the solution.

24. A method for vaporizing reactants for vapor deposition of a thin film on a substrate, comprising:

dissolving a precursor in a solvent that satisfies the formula:

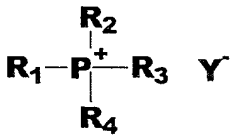


wherein R_1 and R_2 are alkyl and Y^- is selected from the group consisting of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof; and

bubbling a stream of gas through the solution containing the precursor to distill precursor molecules in the vapor phase from the solution.

25. A method for vaporizing reactants for vapor deposition of a thin film on a substrate, comprising:

dissolving a precursor in a solvent that satisfies the formula:

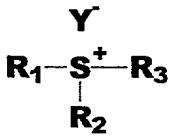


wherein R_1, R_2, R_3, R_4 are alkyl and Y^- is selected from the group consisting of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof; and

bubbling a stream of gas through the solution containing the precursor to distill precursor molecules in the vapor phase from the solution.

26. A method for vaporizing reactants for vapor deposition of a thin film on a substrate, comprising:

dissolving a precursor in a solvent satisfying the formula:

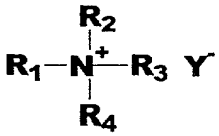


wherein R_1, R_2, and R_3 are alkyl and Y^- is selected from the group consisting of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof; and

bubbling a stream of gas through the solution containing the precursor to distill precursor molecules in the vapor phase from the solution.

27. A method for vaporizing reactants for vapor deposition of a thin film on a substrate, comprising:

dissolving a precursor in a solvent that satisfies the formula:

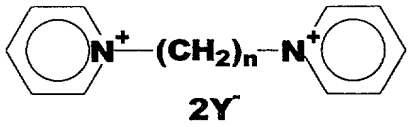


wherein R_1, R_2, R_3, R_4 are alkyl and Y^- is selected from the group consisting of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof; and

bubbling a stream of gas through the solution containing the precursor to distill precursor molecules in the vapor phase from the solution.

28. A method for vaporizing reactants for vapor deposition of a thin film on a substrate, comprising:

dissolving a precursor in a solvent that satisfies the formula:



$2Y^-$

wherein n is from 1 to 10 and Y^- is selected from the group consisting of halides, sulfates, nitrates, acetates, nitrites, tetrafluoroborates, tetrachloroborates, hexafluorophosphates, $[SbF_6]^-$, chloroaluminates, bromoaluminates, chlorocuprates, heteropolyanions, trifluoromethanesulfonates, and mixtures thereof; and

bubbling a stream of gas through the solution containing the -precursor to distill precursor molecules in the vapor phase from the solution.

29. An apparatus for vaporizing and transporting precursor molecules to a deposition chamber for deposition of a thin film on a substrate, the apparatus comprising:

a vessel containing an ionic liquid;

a carrier gas source in fluid communication with the vessel; and

a deposition chamber in fluid communication with the carrier gas source.

30. An apparatus for vaporizing and transporting precursor molecules to a deposition chamber for deposition of a thin film on a substrate, the apparatus comprising:

a vessel containing an ionic liquid having a precursor dissolved therein;

a bubbler device for bubbling a carrier gas source through the vessel; and

a gas line for transporting carrier gas and vaporized precursor molecules from the vessel to the deposition chamber.

31. An apparatus for vaporizing and transporting precursor molecules to a deposition chamber for deposition of a thin film on a substrate, the apparatus comprising:

an ionic liquid source;

a carrier gas source in fluid communication with the ionic liquid source; and

a deposition chamber in fluid communication with the carrier gas source.

32. An apparatus for vaporizing and transporting precursor molecules to a deposition chamber for deposition of a thin film on a substrate, the apparatus comprising:

an ionic liquid source;

a carrier gas source;

a bubbler device for delivering the carrier gas source to the ionic liquid source; and

a deposition chamber in fluid communication with the ionic liquid source to receive vaporized molecules from the ionic liquid source.